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U. S. PTO Customer No. 25280

Case No. 1978A

## IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

September 29, 2000

Docket Number 19781

## DIVISIONAL APPLICATION UNDER 37 C.F.R. §1.53

BOX PATENT APPLICATION (Divisional)  
 Commissioner for Patents  
 Washington, DC 20231

JC928 U.S. PTO  
 09/676161  
 09/29/00

Sir:

Transmitted herewith for filing is a divisional application of U.S. Patent Application Serial Number 08/976,225, filed on November 21, 1997, of Brian G. Morin, Daniel T. McBride, and Loren W. Chambers for METHOD OF MANUFACTURING LOW CONTAMINANT WIPER. The filing fee is calculated below:

## CLAIMS AS FILED, LESS ANY CLAIMS CANCELLED BY AMENDMENT

	Number Filed	Less	Equals	x Rate	TOTALS
Basic Fee	*****	*****	*****	*****	\$690.00
Total Claims	18	20	0	18.00	0
Independent Claims	2	3		78.00	0
<b>TOTAL FILING FEE</b>	*****	*****	*****	*****	\$690.00

1. Please amend the specification to include "Related Applications: This application is a divisional of U.S. Patent Application Serial Number 08/976,225, filed on November 21, 1997."
  2. A check in the amount of \$690.00 to cover the Filing Fee is enclosed.
  3. The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any over-payment to Deposit Account No. 04-0500. A duplicate copy of this sheet is enclosed.
  4. The present application claims the benefit of the above-referenced prior U.S. application.
  5. The application contains
    - 17 pages of specification
    - 4 pages of claims
    - 1 page of abstract
    - 1 sheets of drawings
- and is a true copy of the above-referenced prior U.S. application.

JC927 U.S. PTO  
 09/29/00

00676161-092900

6. A true copy of the declaration and power of attorney filed in the above-referenced prior U.S. application is enclosed.


7. A Preliminary Amendment of the claims is enclosed.

8. An assignment of the invention is enclosed.

September 29, 2000

Respectfully submitted,

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**EXPRESS MAIL CERTIFICATE**

Express Mail label number EK970196900US  
Date of Deposit: September 29, 2000

I hereby state that this correspondence is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under 37 C.F.R. §1.10, along with (1) Check No. 867530 in the amount of \$690.00; (2) Preliminary Amendment; (3) true copy of U.S. Patent Application Serial No. 08/976,225, along with a true copy of the declaration and power of attorney and assignment; and (4) Post Card Receipt, on the date indicated above and is addressed to BOX PATENT APPLICATION (Divisional), Assistant Commissioner for Patents, Washington, DC 20231.

  
Charlotte C. Wilson, Patent Agent

005260 1 3 4 3 5 0

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

Application of: Brian G. Morin et al.  
Serial Number: TO BE ASSIGNED  
Filed: September 29, 2000  
For: **METHOD OF MANUFACTURING LOW  
CONTAMINANT WIPER**  
Group Art Unit: TO BE ASSIGNED  
Examiner: TO BE ASSIGNED

**Preliminary Amendment**

Honorable Commissioner for Patents  
Washington, D. C. 20231

Sir:

Please enter the following amendments.

**In the Specification**

At page 9, line 14, substitute "tests" for "test".

**In the Claims**

Please cancel Claims 10 – 16, without prejudice, and add Claims 23 – 25.

23. The article of Claim 17 wherein the wiper has a particle count of particles greater than 0.5 microns of 30 million particles per square meter or less as measured by Biaxial Shake Test IEST-RP-CC004.2.
24. The article of Claim 17 wherein the fabric has been heat set at a temperature of from 200° to 275° F, and the yarn has not been heated above 275° F.
25. The article of Claim 17 wherein the wiper has an absorbance capacity of 4.0 milliliters/m<sup>2</sup> or greater according to IEST-RP-CC004.2 §7.1.

Respectfully requested,

September 29, 2000



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## Method of Manufacturing Low Contaminant Wiper

### **Background of the Invention**

This invention relates to the manufacturing of polyester fabric for wipers, in particular, wipers which release fewer particulate contaminants.

Wipers may be made from knitted, woven or non-woven polyester fabrics. The typical manufacturing process begins with drawing and texturing continuous filament polyester yarn. The textured yarn is knitted or woven to construct a fabric, and the fabric is washed or scoured to remove spinning oils. The fabric may be chemically modified in order to improve its wettability and performance. The fabric is then dried in a "tenter frame" oven at a temperature of between 325 and 450° F, to remove moisture and heat set the fabric. Heat setting dissipates stress in the polyester fibers and stabilizes the fabric.

Next, the fabric is cut into wipers, typically 9 inch by 9 inch squares. The wipers may remain unlaundered or may be washed in a cleanroom laundry, employing special surfactants and highly-filtered and purified water, to reduce the contamination present on the fabric. After washing, the wipers may be packaged dry in air-tight plastic bags, or pre-saturated with a suitable solvent before being packaged, and are ready for use.

These wipers are utilized for a number of different applications, including cleaning within cleanrooms, automotive painting rooms and other cleanroom environments. Each different application emphasizes certain standards these types of

wipers should attain. For example, for wipers utilized in cleanrooms, stringent performance standards must be met. These standards are related to sorbency and contamination, including maximum allowable particulate, unspecified extractable matter and individual ionic contaminants. The standards for particulate contaminant release are especially rigorous and various methods have been devised to meet them. For example, Paley et al., US 4,888,229, describes a wiper having fused borders, the sealed edge of the wipers being present to reduce contamination caused by small fibers. Diaber et al., US 5,229,181, describes a knit fabric tube, only two edges of which must be cut and sealed, thereby reducing the contamination caused by loose fibers from the edges. Paley et al., US 5,271,995, describes a wiper for a cleanroom environment that has reduced inorganic contaminants through the use of a specific yarn, namely "nylon bright". Reynolds, US 5,069,735, describes a procedure to cut the fabric into pieces using a hot air jet in the range of 600 to 800° F to melt the fibers, forming a sealed edge product with reduced loose fiber contamination.

Despite advances made in reducing particulate contamination release from cleanroom wipers, further reductions in particulate release are, nevertheless, highly desirable.

**Summary of the Invention**

Therefore, an object of the invention is to provide a low contaminant wiping cloth suitable for a wide range of applications. Another object of the invention is to provide a wiper which meets substantially all of the specifications for use in cleanrooms, particularly Class 100 cleanrooms and below, to provide an improved method of manufacturing a cleanroom wiper and to provide a wiper having a substantial reduction in particulate release. A further object of the invention is to provide a cleanroom wiper having a high liquid sorbency capacity. Yet another object of the invention is to provide a wiper which is dimensionally stable. The term dimensionally stable means, in this instance, a wiper which lies substantially flat and does not curl into a roll, especially after the wiper is laundered. Preferably, the wiper does not undergo any appreciable linear shrinkage (less than 5%) when it is exposed to a heat source of 175 degrees fahrenheit for 5 minutes.

Accordingly, a method of manufacturing a textile article for use in a cleanroom is provided having the steps of constructing a knitted or woven fabric from polyester yarn, heat setting the fabric at a temperature of from 180° to 300° F and cutting the fabric to form the desired article; wherein the polyester fiber has not been heated above a temperature of 300° F. The invention also includes a textile article, such as a wiper, made according to the aforementioned process.

Without being bound to a particular theory, it is believed that heating the polyester fiber above 300° F causes low molecular weight polymers or oligomers to blossom to the surface of the polyester fiber, where they crystalize into small particles. These small particles, known as "trimer particles" can number as high as  $1 \times 10^9$  or greater particles per square meter, have a high affinity for the polyester fabric and are very difficult to remove using conventional laundering procedures. Nevertheless, the trimer particles can release from the fabric and become a source of contamination. Applicant has established a direct correlation between the temperature to which the polyester fiber has been exposed and particulate contamination released from the fabric.

The invention, including alternate embodiments thereof, incorporates the advantages of being adaptable to existing manufacturing processes; reducing particulate contamination on the fiber dramatically; being useful with conventional polyester fibers; and having high sorbency capacity and dimensional stability, as defined above.

### **Brief Description of the Drawings**

Figure 1 is a graph of particulate contaminates greater than 0.5 microns (millions per square meter) versus the maximum temperature (degrees F) to which the fabric has been exposed as measured by the Biaxial Shake Test (IEST-RP-CC-004.2 § 5.2) on unlaundered fabric.



### **Detailed Description of the Invention**

Without limiting the scope of the invention, the preferred embodiments and features are hereinafter set forth. Unless otherwise indicated, all parts and percentages are by weight, conditions are ambient, i.e. one atmosphere of pressure and 25° C.

5 All of the United States patents cited in the specification are hereby incorporated by reference.

The wipers of the present invention may be constructed from woven or knitted polyester fibers, preferably fibers of poly(ethylene terephthalate). It is also preferable to construct the fabrics from continuous filament, polyester yarn. Yarns having a wide  
10 variety of denier and filament count may be employed. Examples of useful yarns are those having a denier to filament ratio of from 0.1 to 10, a denier of 15 to 250 with filament counts ranging from 10 to 250. A wide range of fabric weights may be employed in the present invention. Typically, the fabrics used for cleanroom wipers have a weight of 1 to 9 ounces per square yard, preferably 3 to 7 ounces per square yard.

15 The yarn employed in the fabric may be a textured polyester yarn. Such yarns are commercially available and their manufacture is well known in the arts. Briefly, partially oriented yarn (POY) is modified by crimping, imparting random loops, or otherwise modifying the bulk or surface texture of yarn to increase cover, absorbency, resilience, abrasion resistance, warmth, insulation and/or to improve aesthetics. A general  
20 description of the texturing process may be found in the Encyclopedia of Textiles, Fibers,

and Non-woven Fabrics, Encyclopedia Reprint Series, Ed. Martin Grayson, pages 381-398, John Wiley and Sons (1984) and Dictionary of Fiber and Textile Technology, Hoechst Celanese (1989). The yarn is preferably not heated above a temperature of 300° F during the texturing process, and generally will not be heated above a temperature of 225°F.

The fabric may be washed or scoured to remove spinning oils, dirt and other contamination. Optionally, the fabric may also be chemically modified with a finish to improve its wettability and washability. Examples of applicable chemical modifications may be found in U.S. Patents 3,660,010; 3,676,052; 3,981,807; 3,625,754; 4,014,857; 4,207,071; 4,290,765; 4,068,035; 4,937,277; 3,377,249; 3,535,141; 3,540,835; 3,563,795; 3,598,641; 3,574,620; 3,632,420; 3,650,801; 3,652,212; 3,690,942; 3,897,206; 4,090,844; 4,131,550; 3,649,165; 4,073,993; 4,427,557; 3,620,826; 4,164,392; and 4,168,954. The finish may be applied to the fabric in the form of an aqueous liquor using conventional techniques.

The fabric is heat set to provide dimensional stability, as defined above, which is usually combined with drying the fabric subsequent to washing, scouring or application of miscellaneous finishes. The fabric is preferably heat set at a temperature above what the yarns have previously experienced, after the initial spinning of the fiber. Preferably, the fabric lies flat when it is heat set. The fabric is heat set at a temperature of from 180° to 300° F, preferably from 200° to 275° F, most preferably from 225° to 265° F.

Heat setting may advantageously be performed in a tenter frame oven, in which the fabric is held flat during heating and while it begins to cool. The temperature of the oven may be higher than the temperature actually experienced by the yarn, which will be a function of the oven or dryer temperature profile, length and speed of the fabric through the oven.

The highest temperature which the polyester yarn experiences subsequent to spinning can be determined by Differential Scanning Calorimeter (DSC). Briefly, the method involves heating a sample while measuring heat flow. The highest temperature experienced by the sample appears as a broad peak. In order to minimize generation of particulates, the maximum temperature to which the yarn is heated during any processing step is 300° F or below, preferably 275° F or below, most preferably 265° F or below.

The fabric is cut into nominal sizes for use as a cleanroom wiper, which are preferably squares ranging from 6 inch by 6 inch to 12 inch by 12 inch, with 9 inch by 9 inch squares being common. Any geometric shape may be employed as the shape of the inventive wipes. The fabric is preferably, though not necessarily, cut using a technique which fuses the end of the yarn, thereby preventing unraveling and particle generation. Examples of suitable techniques may be found in Reynolds, US 5,069,735, and the references cited therein.

The inventive wipes may also be utilized in automotive paint rooms where the area itself is not necessarily substantially free from contamination. The low level of

contaminants which may be released from the inventive wipes aids in the spray painting of an automobile. Prior to the application of paint coats to the body of the automobile or component part thereof, it may be necessary to clean unwanted liquids or debris from the surface. The inventive wipes provide such a painter with a cleaning article which will deposit a minimum of debris, fibers, or other type of contaminant on the surface to be painted.

Prior to packaging the wipers for use in cleanrooms, it is desirable to wash the fabric or wipers in a cleanroom laundry, which may be characterized as a laundry facility to remove and minimize contamination of the wipers. The cleanroom laundry may employ special filters, surfactants, sequestrants, purified water, etc. to remove oils, reduce particle count and extract undesirable ion contaminants. Examples of suitable equipment and description of cleanroom laundries may be found in Austin, Dr. Philip R., "Encyclopedia of Cleanrooms, Bio-Cleanrooms and Aseptic Areas", Contamination Control Seminars, Michigan (1995).

### Testing

Among the standards which may be imposed on cleanroom wipers include performance criteria related to sorbency and contaminants. One standard for evaluating cleanroom wipers is the Institute of Environmental Sciences & Technology (IEST), Contamination Control Division Recommended Practice 004.2, which may be cited as

IEST-RP-CC004.2, "Evaluating Wiping Materials Used in Cleanrooms and Other Controlled Environments".

Section 7 of Recommended Practice 004.2 sets forth some of the tests utilized for determining the capacity and rate sorption of cleanroom wipers. The capacity tests is performed by saturating a known area of wiper with a selected liquid and then calculating the volume sorbed per unit mass and per unit area of wiper (IEST-RP-CC004.2 § 7.1). The sorbency per unit mass is referred to as the "intrinsic sorbency" and is the volume of liquid in milliliters sorbed per unit of mass of wiper in grams. The "extrinsic sorbency" is the volume of liquid in milliliters sorbed per unit area of wiper in square meters.

The rate of sorption of a cleanroom wiper is measured by allowing a drop of water to fall from a fixed height onto the surface of a wiper. The time required for the disappearance of specular reflection from the drop is measured and recorded as the sorption rate (IEST-RP-CC004.2 § 7.2).

The primary test for contamination associated with cleanroom wipers are those measuring particles, unspecified extractable matter, and individual ionic constituents. The number of particles released during wetting and mechanical stress can be measured in the Biaxial Shake Test (IEST-RP-CC004.2 § 5.2). Briefly, the wipers are placed in a jar of water and shaken. Aliquots are removed from the shaker and the number of particles is counted, typically those in the size range of 0.1 microns and larger are

specified. The number of particles greater than a given particle size are reported in millions per square meter of fabric.

The amount of extractable contamination associated with a cleanroom wiper is determined by extracting the wiper with a solvent, such as water, isopropyl alcohol or acetone, evaporating the solvent and weighing the non-volatile residue (IEST-RP-CC004.2 § 6.1). The quantity of extracted matter may be reported as mass extracted per mass of wiper or mass extracted per unit area of wiper.

The organic and inorganic non-volatile residue may be further analyzed, when it is desirable to know how much of a particular species is present. Typically, the non-volatile residue is tested for various inorganic, anionic or cationic constituents, for example Al, Ca, Cl, F, Li, Mg, K, Na and Zn (IEST-RP-CC004.2 §6.2).

The invention may be further understood by reference to the following examples.

#### EXAMPLE 1

The effect of heat setting temperature on particulate contamination was tested as follows.

Partially oriented yarn (POY) was drawn and textured on a false twist texturing machine at a maximum temperature of approximately 180° F. The textured yarn was circular knit into a fabric of approximately 4 ounces per square yard. This fabric was scoured in a jet to remove spinning oils, for 20 minutes at 180° F. The fabric was dried on a tenter frame oven at 250° F, at a speed of 25 yards per minute.

The fabric was rewet, and samples of the fabric were dried and heat set on a tenter frame oven at temperatures ranging from 250° to 400° F. The fabric samples were then cut into 9" x 9" squares and tested for particulate contamination according to the Biaxial Shake Test (IEST-RP-CC004.2 & 5.2). The results of the test are shown in Table 1 below, and in Figure 1. The heat history of the fabric was tested using a differential scanning calorimeter (DSC). The highest temperature to which the fabric (and yarn) had been heated is also reported in Table 1 below. Pieces of the fabric were cut and viewed under a scanning electron microscope (SEM). The SEM pictures show very little surface particles on the fabric heat set at 250° F, with increasing surface particles as the heat set temperature is increased to 400° F.

TABLE 1

<i>Tenter Temperature</i>	<i>DSC Measured Temp</i>	<i>Unwashed -greater than 0.5 microns-particles</i>
(degrees F)	(degrees F)	(million particles/sq. meter)
250	261	30
275	288	45
300	297	58
325	313	72
350	351	162
375	372	225
400	394	196

## EXAMPLE 2

A test was conducted to test the release of particles from wipers which were heat set at various temperatures and were saturated in a mixture of water and 2-propanol.

Two types of partially oriented yarn (POY) were drawn and textured on a false twist texturing machine at a maximum temperature of approximately 180° F. The textured yarns, 70 denier/34 filament and 70 denier/100 filament, were circular knit into a fabric in a 3:1 ratio, respectively, to give a weight of approximately 4 ounces per square yard. This fabric was scoured in a jet to remove spinning oils, for 20 minutes at 180° F. The fabric was designated Style "A". Samples of the fabric were dried in a tenter frame oven at three temperatures: 250° F, 300° F, and 350° F, at speeds of 25, 35, and 50 yards per minute respectively. The fabric was then cut into 9" x 9" wipers, and washed and dried in a cleanroom laundry.

These wipers were placed into packages of 50 wipers each and saturated with 540 ml of a mixture of 95% ultrapure water and 5% submicron filtered 2-propanol. These packages were allowed to sit for more than 24 hours. They were then opened and two wipers from each package were tested for particulate contamination according to the Biaxial Shake Test (IEST-RP-CC004.2 & 5.2). Five packages each were tested from the fabric heat set at 250 and 300 degrees. Ten packages were tested from the fabric heat set at 350 degrees. The results of the Biaxial Shake Test are shown below in Table 2. The "small particles" reported



are those measuring between 0.5 and 20 microns and the "large particles" reported are those measuring between 5 and 20 microns.

TABLE 2

<i>Fabric Style</i>	<i>Heat Set Temperature Degrees C</i>	<i>Small Particles (std. dev.) millions/sq. m.</i>	<i>Large Particles (std. dev.) millions/sq. m.</i>
A	250	17.1 (3.8)	0.29 (0.04)
A	300	22.6 (8.0)	0.33 (0.20)
A	350	57.7 (11.1)	1.03 (0.22)

## EXAMPLE 3

Three fabric styles were heat set at various temperatures and the absorption capacity, dry weight and thickness were tested.

Fabric Style A of Example 2 was wet out and dried in the tenter frame oven at 250, 275, 300, and 350 degrees F at 40, 45, 53, and 55 yards per minute respectively. Fabric Style B and Style C are circular knit fabrics constructed entirely of 70/34 POY yarn, prepared according to Example 2. Style B weighed 4.0 oz. per square yard and Style C weighed 3.5 oz. per square yard. Both Styles B and C were dried in the tenter frame oven

at 250 and 350° F. Then, Styles B and C were cut into wipers, and washed and dried in a cleanroom laundry.

All of the fabrics, Style A, B and C were tested for absorption capacity, dry weight and thickness. Absorption capacity was tested according to IEST-RP-CC004.2 § 7.1 At least three samples were tested from each style. Averages are shown in Table 3, with the standard deviation shown in parentheses.

This data shows that the increased absorption capacity seen with a lower heatset temperature corresponds to increased bulk in the fabric. Samples of the fabric of style A, heatset at 250° F and at 350° F, was observed under an optical microscope. The fabric at 350° F has more holes between the knit loops than the more bulky fabric heatset at 250° F.

Table 3

Fabric Style	Heat Set Temp	Absorbency	Dry Weight	Thickness
A	250	631 (10)	158 (3)	34.2 (0.5)
A	275	608 (14)	156 (3)	32.8 (0.4)
A	300	615 (19)	158 (4)	33.0 (0.4)
A	350	508 (13)	150 (3)	28.0 (0.3)
B	250	548 (23)	141 (1)	33.3 (0.3)
B	350	477 (17)	143 (3)	29.4 (0.6)
C	250	472 (16)	117 (4)	25.7 (0.9)
C	350	405 (9)	117 (2)	22.5 (0.7)

The foregoing examples clearly demonstrate the correlation between heat setting the fabric at a temperature below 300° F and (a) the reduction of contaminants; and (b) increased absorbance capacity of the cleanroom wipers.

Following the process of the present invention it is possible to reduce particulate contamination of particles greater than 0.5 microns to a level of less than 75 million/meters<sup>2</sup> for presaturated wipers, and less than 30 million/meters<sup>2</sup> for dry packaged wipers, as measured by the Biaxial Shake Test (IEST-RP-CC004.2 § 5.2); to reduce particle contamination of particles greater than 5 microns to a level of less than 25 million/m<sup>2</sup> for unlaundered wipers, as measured by the Biaxial Shake Test (IEST-RP-CC004.2 § 5.2); to reduce non-volatile residues with water extraction to less than .005 grams/meters<sup>2</sup>, and even less than .003 grams/meters<sup>2</sup> as measured by short term

extraction (IEST-RP-CC004.2 §6.1.2); and to achieve absorbance capacities of 3.75 milliliters/meters<sup>2</sup> or greater, and even 4.0 milliliters/meters<sup>2</sup> or greater.

Further, the cleanroom wipers of the present invention demonstrate good dimensional stability, i.e. they remain relatively flat and do not roll up after laundering.

5 The cleanroom wipers find utility in virtually any environment where a low contaminate, high absorbance wiping cloth is desired, such as in semiconductor and pharmaceutical cleanrooms, and in preparation of surfaces for painting or other coating. The wipers may be presaturated with a desired solvent and sold in sealed dispensers, as is well known in the art. Suitable solvents include water, organic solvents such as naphtha, and aqueous  
10 solutions of water miscible organic solvents, in particular solutions of alcohols, such as C<sub>1</sub>-C<sub>8</sub> alcohols, especially isopropanol, and water. Of particular interest are wipers presaturated with a solution of isopropanol and water, especially 1 to 99 wt.% isopropanol/water solutions. The solvent composition may also contain a surfactant and/or other additives selected for their cleaning characteristics. By way of example,  
15 additional solvents and packages for pre-saturated wipers may be found in the following references: US 3,994,751; US 4,627,936; US 4,639,327; US 4,998,984; US 5,145,091; US 5,344,007 and JP 6[1994]-48475. Alternatively, the wipers may be sealed in air tight packages while dry.

There are, of course, many alternate embodiments and modifications of the invention, which are intended to be included within the scope of the following claims.

What I claim is:

1. A method of cleaning a surface comprising the step of wiping the surface with a fabric constructed from polyester fiber, wherein the fabric has been heat set at a temperature of from 180° to 300° F and the fiber has not been heated above 300° F.
- 5        2. The method of Claim 1 wherein the fabric is woven or knitted from continuous filament, polyester yarn.
3. The method of Claim 2 wherein the fabric has been presaturated with a solvent and sealed in a package prior to being used to wipe the surface, and the fabric has a particle count of particles greater than 0.5 microns of 75 million particles per square  
10        meter or less as measured by Biaxial Shake Test IEST-RP-CC004.2.
4. The method of Claim 3 wherein the fabric is heat set at a temperature of from 200° to 275° F, and the fiber has not been heated above a temperature of 275° F.
5. The method of Claim 2 wherein the fabric has an unlaundered particle count of particles greater than 5 microns of less than 25 million/m<sup>2</sup>, as measured by Biaxial Shake  
15        Test (IEST-RP-CC004.2).
6. The method of Claim 2 wherein the fabric has been sealed in a package while dry, prior to being used to wipe the surface.

7. The method of Claim 6 wherein the fabric has a particle count of particles greater than 0.5 microns of 30 million particles per square meter or less as measured by Biaxial Shake Test IEST-RP-CC004.2.

5 8. The method of Claim 7 wherein the fabric is heat set at a temperature of from 200° to 275° F, and the fiber has not been heated above a temperature of 275° F.

9. The method of Claim 1 wherein the surface is selected from the group consisting of an automobile body or component thereof, and semiconductor or pharmaceutical cleanrooms.

10 10. A method of manufacturing a wiper comprising the steps of:

- (a) weaving or knitting a fabric from continuous filament, textured, polyester yarn;
- (b) heat setting the fabric at a temperature of from 180° to 300° F;
- (c) cutting the fabric to form a wiper; and
- (d) sealing the wiper in a package;

wherein the yarn has not been heated above a temperature of 300° F.

15 11. The method of Claim 10 wherein the wiper is presaturated with a solvent prior to being sealed in the package.

12. The method of Claim 11 wherein the wiper has a particle count of particles greater than 0.5 microns of 75 million particles per square meter or less as measured by Biaxial Shake Test IEST-RP-CC004.2.

13. The method of Claim 10 wherein the wiper is laundered prior to being sealed in the package.

14. The method of Claim 10 wherein the wiper is dry when sealed in the package.

15. The method of Claim 14 wherein the wiper has a particle count of particles greater than 0.5 microns of 30 million particles per square meter or less as measured by Biaxial Shake Test IEST-RP-CC004.2.

16. The method of Claim 10 wherein the wiper is heat set at a temperature of from 200° to 275° F, and the yarn has not been heated above a temperature of 275° F.

17. An article comprising a fabric wiper constructed of continuous filament polyester yarn, wherein the fabric has been heat set at a temperature of from 180° to 300° F, and the fabric has not been heated above a temperature of 300° F.

18. The article of Claim 17 further comprising a sealed package containing the wiper.

19. The article of Claim 18 wherein the wiper is saturated with a solvent and wherein the wiper has a particle count of particles greater than 0.5 microns of 75 million particles per square meter or less as measured by Biaxial Shake Test IEST-RP-CC004.2.

20. The article of Claim 18 wherein the wiper is dry and wherein the wiper has a particle count of particles greater than 0.5 microns of 30 million particles per square meter or less as measured by Biaxial Shake Test IEST-RP-CC004.2.



21. The article of Claim 17 wherein the fabric wiper has an unlaundered particle count of particles greater than 5 microns of less than 25 million/m<sup>2</sup>, as measured by Biaxial Shake Test IEST-RP-CC004.2.

5 22. The article of Claim 17 wherein the fabric wiper is heatset at a temperature of from 225°-265° F.

### **Abstract of the Disclosure**

A method of manufacturing a polyester textile fabric having a relatively low level of particulate contaminates and high absorbency is provided by heatsetting the fabric at a temperature of 300° F or less.



**DECLARATION FOR PATENT APPLICATION**

As below named inventors, we hereby declare that:

Our residence, post office addresses and citizenship are as stated below next to our names. We believe we are the original, first and joint inventors of the subject matter which is claimed and for which a patent is sought on the invention entitled **Method of Manufacturing Low Contaminant Wiper**, the specification of which is attached hereto.

We hereby state that we have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

We acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, §1.56(a).

We hereby claim the benefit under Title 35, United States Code §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code §112, we acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, §1.56(a) which occurred between the filing date of the prior application and the national or PCT International filing date of this application:

_____	_____	_____
(Application Serial No.)	(Filing Date)	(Status)
		(patented, pending or abandoned)

We hereby claim foreign priority benefits under Title 35, United States Code §119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed.

_____	_____	_____
(Application Serial No.)	(Filing Date)	(Status)

**POWER OF ATTORNEY:** As named inventors, we hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith.

Terry T. Moyer, Registration Number 26,008 and Timothy J. Monahan, Registration Number 32,481

**SEND CORRESPONDENCE TO:**

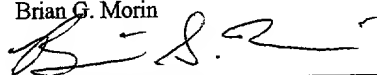
Terry T. Moyer  
P. O. Box 1927  
Spartanburg, SC 29304

**DIRECT TELEPHONE CALLS TO:**

Timothy J. Monahan  
(864) 503-1540

We hereby declare that all statements made herein of our own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

**Full name of sole or first inventor:** Brian G. Morin

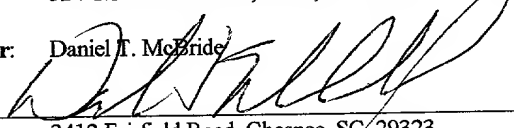
Inventor's Signature:  Date: November 21, 1997

Residence: 324 Thornbush Court, Greer, SC 29651

Citizenship: USA

Post Office Address: 324 Thornbush Court, Greer, SC 29651

**Full name of second joint inventor:** Daniel T. McBride

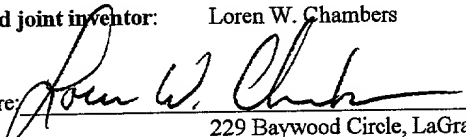
Inventor's Signature:  Date: November 21, 1997

Residence: 3412 Fairfield Road, Chesnee, SC 29323

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**Full name of third joint inventor:** Loren W. Chambers

Inventor's Signature:  Date: November 21, 1997

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